

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
3 June 2004 (03.06.2004)

PCT

(10) International Publication Number  
WO 2004/045715 A1

(51) International Patent Classification<sup>7</sup>: A61N 2/00, 2/02, 1/06

(21) International Application Number:  
PCT/PL2003/000026

(22) International Filing Date: 17 March 2003 (17.03.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
P.357149 15 November 2002 (15.11.2002) PL

(81) Designated States (*national*): AE (utility model), AT (utility model), AU, BG (utility model), BR (utility model), BY (utility model), CA, CH, CN (utility model), CZ (utility model), DE (utility model), DK (utility model), DZ, EE (utility model), ES (utility model), FI (utility model), GB, GE (utility model), HR, HU (utility model), ID, IL, IN, IS, JP (utility model), KR (utility model), KZ (utility model), LT, LU, LV, MA, MK, MX (utility model), NO, NZ, PT (utility model), RO, RU (utility model), SE, SK (utility model), TN, TR (utility model), UA (utility model), US, UZ (utility model), VN, YU (petty patent), ZA.

(84) Designated States (*regional*): Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR).

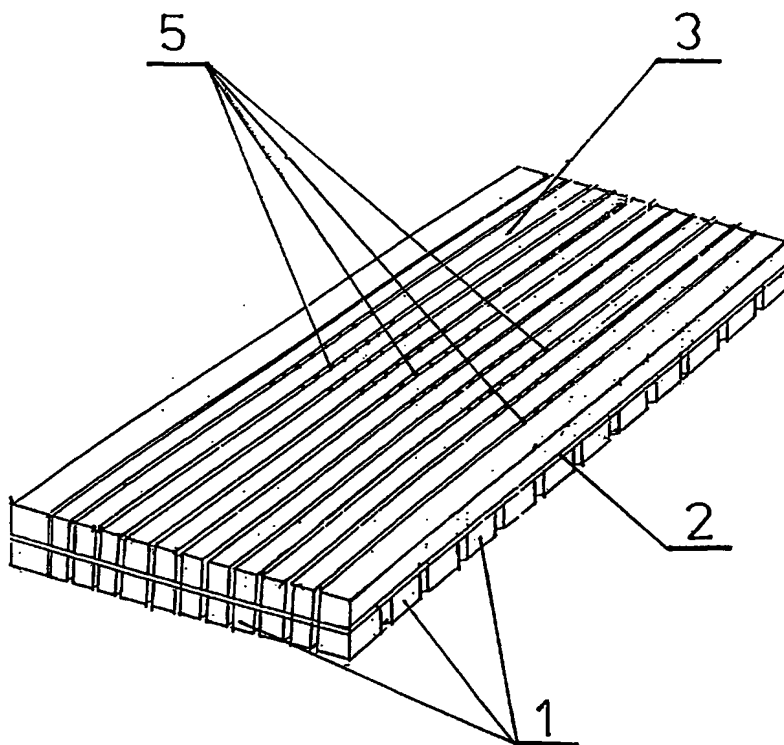
(71) Applicant and  
(72) Inventor: PIOTROWICZ, Mariusz [PL/PL]; ul. Zurawiec 2, PL 32-500 Chrzanów (PL).

Published:  
— with international search report

(74) Agent: DRELICHOWSKI, Henryk; P.O. Box 24, PL-31-816 kraków 39 (PL).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: APPARATUS FOR STIMULATING THE PHYSIOLOGICAL PROCESSES OF LIVING ORGANISM USING LIGHT WAVES ELECTROMAGNETIC INDUCTION AND THERMAL INTERACTION



(57) Abstract: The subject of the invention is an apparatus for stimulating the physiological processes of living organisms using light waves, electromagnetic induction and thermal interaction, simultaneously bringing both the cells and molecules of living organism into an energetically richer excited state. The apparatus comprises a number of supports with an identical height and optional shape. These are connected with the upper plane of the apparatus, this comprising a thinly woven material (2). The thinly woven material (2) is lined from above with an insulating thermal material (3). The supports (1) in their lower part have installed electromagnetic wave emitters (4) that emit an electromagnetic field with a frequency ranging from 10 Hz to 100 Hz and with electromagnetic induction ranging from 0.001  $\mu$ T to 80  $\mu$ T. electromagnetic wave emitters (4) simultaneously emit the required quantity of heat. In order to enable the permeation of air and thermal emission, the insulating thermal material (3) has freely spaced and optionally shaped openings enabling thermal material 3) there are installed light wave emitters (5), which emit waves with a length ranging from 380 nm to 630 nm.

5

Apparatus for stimulating the physiological processes of living  
organisms using light waves, electromagnetic induction  
and thermal interaction.

10

The subject of the invention is an apparatus for  
stimulating the physiological processes of living  
organisms using light waves, electromagnetic waves and  
15 thermal interaction, simultaneously bringing both the  
cells and molecules of living organism into an  
energetically richer excited state.

Various types of apparatuses emitting variable  
electromagnetic fields, apparatuses emitting thermal  
20 waves, as well as apparatuses emitting light waves are  
well known.

United States of America patent specification no.  
4,685,462 concerns an apparatus for the treatment of  
hypothermia using a magnetic field. The apparatus in  
25 question is equipped with two spiral induction coils  
coupled with an RF generator through an automatic  
frequency tuning system which includes condensers and  
induction coils. The spiral coils are located in  
a non-conducting cylinder that constitutes an element of  
30 the shield. One of the coils receives a signal from the  
RF generator with a frequency tuned to the resonance,  
while the other - by mutual induction.

United States of America patent specification no. 5,344,384 concerns an apparatus for magnetotherapy that is stimulated by a magnetic field generated periodically from coils with a field frequency ranging from 10 to 90 Hz when required. This apparatus functions as a stimulator for sick parts of the human body. It comprises a number of flexible elements that are permanently connected with each other. Each of these elements has an internal magnetic field generator, made up of a high-power coil that fills nearly the entire flexible element. These elements may be permanently connected to create apparatuses in the form of mats, belts and compresses placed on sick parts of the human body.

United States of America patent specification no. 5,453,074 concerns an apparatus for electromagnetic therapy that is intended for human beings and improves the general physical condition thereof. It is made up of a flat base terminating in a headrest and covered with a movable part, which is shorter than the base and moves along it. This apparatus may generate electromagnetic field - safe for the patient - for individual parts of the human body and the head over short periods of time; the fields are generated by electromagnetic generators located in the apparatus' cylinders.

German utility model description no. 299 19 950 concerns a therapeutic lamp for the treatment of individual parts of the human body by means of a concentrated electromagnetic field. This lamp has a concentrated system of spirals located in a narrow housing, emitting an electromagnetic field ensuring extremely limited interaction with specific, small part of the human body.

Various types of apparatuses emitting light waves of varying lengths and with relatively high emission powers, ranging from 30 to 300 W, are well known.

Polish patent specification no. 177426 concerns  
5 a therapeutic lamp for biostimulation utilising polarised light, which includes a spot-light source with a power rating ranging from 30 to 300 W that is located in the focus of a reflector in the shape of a paraboloid of revolution; it contains a light filter plate and  
10 integral plastic housing made up of two tubular parts with identical circular sections, which are connected with each other at an angle of  $114^{\circ}$ .

Polish patent specification no. 181716 concerns an apparatus for photodynamic irradiation with a housing  
15 fitted with a lamp, a reflector surrounding the lamp, a set of filters installed on the path of the light beam, a light outlet located behind the set of filters, a dosing device for the precise measuring of radiation energy provided to the patient by the apparatus, and an  
20 electronic range-finder for measuring the irradiation distance and for utilising such measurements when setting the required irradiation distance.

United States of America patent specification no. 6450941 concerns a hair-care and drying apparatus  
25 that stimulates body cells with pulsating electromagnetic radiation; it is powered by current pulses with a frequency ranging from 200 Hz to 20000 Hz and a current pulse amplitude between 15 and 25 V. The pulse duration ranges from 2 to 200 microseconds. At the  
30 same time, infrared radiation of three wavelengths - 600 nm, 900 nm and 1200 nm - and blue light with a wavelength of 400 nm, generated by semiconductor diodes or laser diodes, acts on the hair. The

commencement of pulsating electromagnetic and visible radiation is accompanied by the activation of a blower supplying hot air with a temperature of 37° C, which dries the hair. The apparatus may act on the hair and skin of the head for only a relatively short time, from a few to a few dozen minutes. This time is limited by the complete drying of the hair by the hot air supplied by the electric blower.

The disadvantage of all of the abovementioned apparatuses and methods applied for living organisms consists in the fact that there exists no apparatus enabling the optional connection of electromagnetic and magnetic field emission with the emission of light waves of varying lengths and/or with the emission of heat onto the living organism. For safety reasons, the apparatuses hitherto used may be used only for relatively short periods of time, ranging from a few to a few dozen minutes. This brevity of application is the result of excessive values of magnetic induction emission or the high values of the electromagnetic field acting on the basis of pulses and the high power of lamps emitting light waves, which causes the overheating of the parts of the human body exposed to radiation. When used for longer periods, the apparatuses hitherto known - utilising current frequencies from 200 to 20000 Hz - exert a negative influence on many of the reactions occurring in living organisms.

It is commonly known that the living organism adapts favourably in processes with very low electromagnetic field values and negligible powers of light wave emitters acting thereon, together with an optimal temperature acting on the whole organism at the same time. Such processes should influence the living

organism on a long-term basis, while in certain instances - even continuously over extended periods of time. In the case of living organisms, sleep or rest are the times most appropriate for such types of  
5 interaction.

The objective of the invention consisted in constructing an apparatus that would ensure the safety of stimulation and the course of living processes, and at the same time would make it possible for a living organ-  
10 ism to be influenced by an electromagnetic field with a low value of electromagnetic induction emission, this being accompanied by the negligible power of lamps used for the emission of light waves and the low, non-forced thermal emission over an unlimited period of  
15 time on the organism. An apparatus of this type would also favourably influence the organism in the event of advanced ailments, where the immunological system is already heavily burdened and is unable to withstand the momentary, strong action of existing apparatuses.

20 In accordance with the invention, the apparatus for stimulating the physiological processes of living organisms has an optional spatial form, limited by two parallel or nearly parallel planes. Between these planes there is a space with an appropriately selected height,  
25 which may be limited by side walls. The apparatus is made up of a number of supports of equal height and optional shape. These supports are connected with the upper plane of the apparatus, this being thinly woven material or - preferably - a mesh of glass fibre or any  
30 other material, inhibiting the development of bacteria. In accordance with the invention, the upper side of the thinly woven material is lined with an insulating thermal material, advantageously elastic and with

fungicidal and bactericidal properties. In the lower parts of the supports, immediately above their plane of foundation, there are installed emitters of electromagnetic waves, advantageously coils and/or groups of coils emitting an electromagnetic field with a frequency ranging from 10 Hz to 100 Hz and with electromagnetic induction ranging from 0.001  $\mu$ T to 80  $\mu$ T. Preferably, the frequency of the electromagnetic field should range from 50 to 60 Hz, while the electromagnetic induction - from 0.01  $\mu$ T to 5.00  $\mu$ T. The electromagnetic wave emitters also emit the required quantity of heat. The electromagnetic wave emitters are selected in such a way, so that at the level of the upper plane of the apparatus, slightly above the thinly woven material or at the level thereof, at each and every point of the upper plane of the apparatus - in accordance with the invention - it is possible to obtain any value of electromagnetic induction within the range 0,001  $\mu$ T - 80  $\mu$ T. In order to enable the penetration of air and thermal emission, the insulating thermal material has freely placed and optionally sized openings which let through air. These openings may have the shape of elongated slits. They may also be round or ellipsoidal, with varying or identical diameters, or create slits around honeycombed regular polygons made of the insulating thermal material. The slits or openings in the insulating thermal material contain light wave emitters, which emit waves with lengths ranging from 380 nm to 630 nm and a generated frequency from 0.5 MHz to 100 MHz. It is advantageous for the emitted light waves to have a generated frequency within the range of 0.8 MHz to 1.2 MHz. The light wave emitters in the openings of the insulating thermal material are

installed in quads or in series, and comprise emitters emitting light with an identical length of the light wave or with light wave lengths varying within the range 380 nm - 630 nm. In these slits or openings in the insulating thermal material there are installed from one to many emitters of light waves, depending on requirements; it is favourable for the number of emitters to total between 1 and 8. It is important for the light wave emitters to occupy 2/3 of the length of the apparatus, or the central part thereof. The light wave emitters are low-power units up to 100 mW, and it is advantageous if they are light diodes with a power from 20 mW to 50 mW. The electromagnetic wave emitters are powered by an alternating current with a voltage that is safe for living organisms, i.e. ranging from 6 to 24 V. The strength of the electromagnetic field emitted by the electromagnetic wave emitters is regulated by changing the intensity of the current flowing through selected electromagnetic wave emitters.

In accordance with the invention, the apparatus is fitted with sensors and devices for the control, measurement and regulation of temperature in the vicinity of the upper plane. It may also be equipped with sensors and devices for the continuous measurement and regulation of the value of emitted electromagnetic induction, at each and every point of the apparatus' upper plane. Both the sensors and the apparatuses for the measurement and regulation of emitted values of electromagnetic induction and the value of heat emitted are connected to the control system of the apparatus. The control system of the apparatus is fitted with a generator of the frequencies of emitted light waves, this enabling the trouble-free adapting of their



frequencies to current operating requirements. Because the control system of the apparatus is fitted with a processor, it is possible to continuously monitor the values of electromagnetic induction emissions, the values of heat emission and light emission by means of a personal computer. In order to enhance operator comfort, the invented apparatus may be divided along its longer side into two or more elements permanently connected with each other, enabling the assembly or disassembly thereof.

In accordance with the invention, a variant of the apparatus may comprise elements of varying shapes and sizes, usually in the form of belts, compresses or other, fixed to individual parts of the living creature. These consist of thermal insulating material with freely shaped openings installed on appropriately shaped thinly woven material. Light wave emitters are installed in these openings. The surface lined with the thermal insulating material adheres directly to the part of the body upon which the appropriately shaped element is placed. The opposite side of the appropriately shaped thinly woven material may have an empty space with an appropriately selected thickness, limited from the outside by a material enabling the controlled, natural penetration of air; to the inside thereof there are fixed electromagnetic wave emitters that emit an electromagnetic field and the required quantity of heat. The entire apparatus - both with installed electromagnetic wave emitters and installed light wave emitters - is powered by batteries or accumulators. The batteries or accumulators also power the system for measuring, controlling and regulating the emission of media by the apparatus. This variant makes it possible

to simultaneously act by means of electromagnetic emission, light emission and heat emission on selected parts of the body of a living organism, without hindering the freedom of movement thereof.

5 In accordance with the invention, another advantageous variant of the apparatus is one with dimensions selected for various objectives used to sit or lie on, including car seats.

In accordance with the invention, a different  
10 variant of the invention is a mattress. The lower plane of the mattress is permanently connected with the side walls. The bottom part of the mattress and its side walls are lined with a leakproof non-permeable material. The internal part of the mattress bottom or the area  
15 just above the bottom carries emitters of electromagnetic waves with an electromagnetic induction in the range  $0.001 \mu\text{T}$  -  $80 \mu\text{T}$ , which also emit the required quantity of heat. It is advantageous if the electromagnetic wave emitters are placed beneath/or  
20 between two fabrics or materials that allow for the passage of heat radiation. The upper layer of the apparatus is a thinly woven material. In accordance with the invention, the thinly woven material comprising the upper layer of the apparatus is lined with an insulating  
25 thermal material. In order to enable the penetration of air and thermal emission, the insulating thermal material has freely spaced and optionally shaped air-permeable openings, in which there may be installed light wave emitters. The side walls of the apparatus may  
30 have ventilating holes, opened and closed manually or automatically whenever it becomes necessary to lower or increase the thermal value emitted by the electromagnetic wave emitters in the direction of the

upper plane of the apparatus. The clear area inside the apparatus, in order to enhance the comfort of the user, may be fitted - this between the bottom and thinly woven material - with a spring-based upholstery structure, with a clear area left around the upholstery springs in order to enable ventilation and the circulation of media within the apparatus and the emission thereof towards the upper plane. The external plane of the bottom and the sides of the apparatus have - typical for mattresses - an easy to remove upholstery, which is partially turned up above the upper edge of the sides on to the insulating material placed above, this in such a way as not to cover the slits or openings in the insulating material.

One of the advantages of the apparatus as presented in accordance with the invention consists in the fact that it is possible to simultaneously act on the living organism by the emission of an electromagnetic field with low values, by the emission of low-power light waves, and also natural heat emission. The low values of media emitted mean that living organisms can freely remain in their reaction field without any time limits. The living organism utilising the apparatus as presented in accordance with the invention is exposed neither to any hazardous high frequencies of the currents flowing through the apparatus, nor to the thermal overheating of skin or internal cells. The apparatus makes it possible to maintain the stable temperature of the living organism, and prevents its overheating or sweating. An additional advantage of the apparatus is that it ensures optimal sleeping conditions, and thus even over a short period of sleep it is possible to ensure the improved regeneration of living organisms. When the apparatus is

adapted to seats, and in particular to car seats, drivers benefit from higher levels of concentration.

In accordance with the invention, the apparatus for stimulating the physiological processes of living organisms has been presented on the basis of the following manufactured example, where Fig.1 presents the apparatus in accordance with the invention with elongated openings, Fig.2 presents the exemplary spacing of the supports of the apparatus, Fig.3 presents an exemplary form of the apparatus, in the shape of a strip, Fig.4 presents an exemplary form of the apparatus in the shape of a leg compress, Fig.5 presents an exemplary form of the apparatus in the shape of a armband, Fig.6 presents the apparatus in the shape of a mattress, Fig.7 presents the apparatus in the shape of a mattress (axonometric section).

In accordance with the invention, the apparatus for stimulating the physiological processes of living organisms, in the shape of a flat rectangular prism, consists of supports 1, to which there are attached electromagnetic wave emitters. The supports 1 are permanently connected to the bottom part of the thinly woven material 2. The upper plane of the thinly woven material 2 is lined with an insulating material that has elongated openings, in which there are installed light wave emitters 5. The variant of the apparatus in the form of a band has a feeder cable and control device 9. The variants of the apparatus in the form of an armband and headband are connected by cable 10 with the feeder cable and control device 9. The variant of the apparatus in the shape of a mattress has light wave emitters 5 fitted in the openings of the insulating material 3. Openings 6 are situated in the side walls of the

mattress-shaped apparatus and at one of the shorter edges, in the thermal insulating material. The electromagnetic wave emitters 4 are installed between the two fabrics 8.

## Patent claims

5 1.The apparatus for stimulating the physiological  
processes of living organisms in the form of  
a rectangular prism, containing between the bottom and  
the upper plane a clear area enabling the emission of  
electromagnetic and thermal waves, with coils fitted  
10 at the bottom, between two fabrics enabling the  
permeation of heat radiation, characterized by its  
optional spatial form, limited by two parallel or  
nearly parallel planes, comprising a number of  
supports (1) with an identical height and  
15 optional shape, permanently connected with the upper  
plane of the apparatus, this comprising a thinly woven  
material (2), lined from above with an insulating  
thermal material (3), whereas the insulating thermal  
material (3) has freely spaced and optionally shaped  
20 openings in which there are installed light wave  
emitters (5) that emit light waves with a length  
ranging from 380 nm to 630 nm, frequency from 0.5 MHz  
to 100 MHz and power of up to 100 mW, while the  
supports (1) in their lower part have installed  
25 electromagnetic wave emitters (4), selected in such  
a way so that at the level of the upper plane of the  
apparatus, slightly above the thinly woven material or  
at the level thereof, at each and every point of the  
upper plane of the apparatus - in accordance with the  
30 invention - it is possible to obtain any value of  
electromagnetic induction within the range 0.001  $\mu$ T -  
80  $\mu$ T, with a frequency of 20 Hz to 80 Hz,  
simultaneously emitting a specific quantity of heat,

whereas the equipment is powered by an alternating current with a voltage that is safe for living organisms, ranging from 6 to 24 V, and is connected to the control system of the apparatus, containing  
5 a generator of the frequencies of emitted light waves.

2.The apparatus, pursuant to patent claim no. 1, characterized by the fact that the electromagnetic wave emitters (4) emit waves with an electromagnetic  
10 induction within the range of 0.01  $\mu$ T to 5.00  $\mu$ T and with a frequency ranging from 40 Hz to 60 Hz.

3.The apparatus, pursuant to patent claim no. 1, characterized by the fact that the thinly woven  
15 material (2) is a mesh made from fibre glass or any other material inhibiting the development of bacteria.

4.The apparatus, pursuant to patent claim no. 1, characterized by the fact that the insulating thermal  
20 material (3) is elastic and has fungicidal and bactericidal properties.

5.The apparatus, pursuant to patent claim no. 1, characterized by the fact that the freely spaced  
25 openings in the insulating thermal material (3) have the shape of elongated slits or circles and/or ellipsoids with differing or identical diameters, or form slits around honeycombed regular polygons.

30 6.The apparatus, pursuant to patent claims nos. 1 and 5, characterized by the fact that the light wave emitters (5) emit light waves with a frequency ranging from

0.8 MHz to 1.2 MHz and are located in series or in quads, in freely selected quantities.

7.The apparatus, pursuant to patent claims nos. 1 and 6,  
5 characterized by the fact that the number of light wave emitters (5) totals between 1 and 8.

8.The apparatus, pursuant to patent claims nos. 1, 6  
and 7, characterized by the fact that the light wave  
10 emitters are situated at 2/3 of the length of the apparatus or in the central part of the upper open plane of the apparatus.

9.The apparatus, pursuant to patent claims nos. 1 and 6,  
15 characterized by the fact that the light wave emitters (5) are diodes with a power of 20 mW to 50 mW.

10.The apparatus, pursuant to patent claim no. 1,  
20 characterized by the fact that it has the shape of belts, compresses or other, attached to individual parts of the human body or as the lining of other objects used to sit or lie on.

25 11.The apparatus, pursuant to patent claim no. 1, characterized by the fact that it constitutes a mattress, the bottom of which is permanently connected with the side walls, whereas the bottom and interior parts of the side walls are lined with  
30 a leakproof non-permeable material, while the internal part of the mattress bottom or the area just above the bottom carries emitters of electromagnetic waves (4) and heat emitters, while the upper plane of



the apparatus is a thinly woven material (2), lined from above with an insulating thermal material (3) that has freely spaced and optionally shaped openings, in which there are located light wave emitters (5), whereas the side walls of the apparatus have ventilation holes (6), opened and closed manually or automatically, and the clear area inside the apparatus is fitted - this between the bottom and thinly woven material - with a spring-based upholstery structure, with a clear area left around the upholstery springs.

12.The apparatus, pursuant to patent claims nos. 1 and 11, characterized by the fact that the electromagnetic wave emitters (4) are coils and/or groups of coils.

13.The apparatus, pursuant to patent claims nos. 11 and 12, characterized by the fact that the coils and/or groups of coils (4) are placed beneath/or between two fabrics or materials (8) enabling the permeation of heat radiation.

1/6

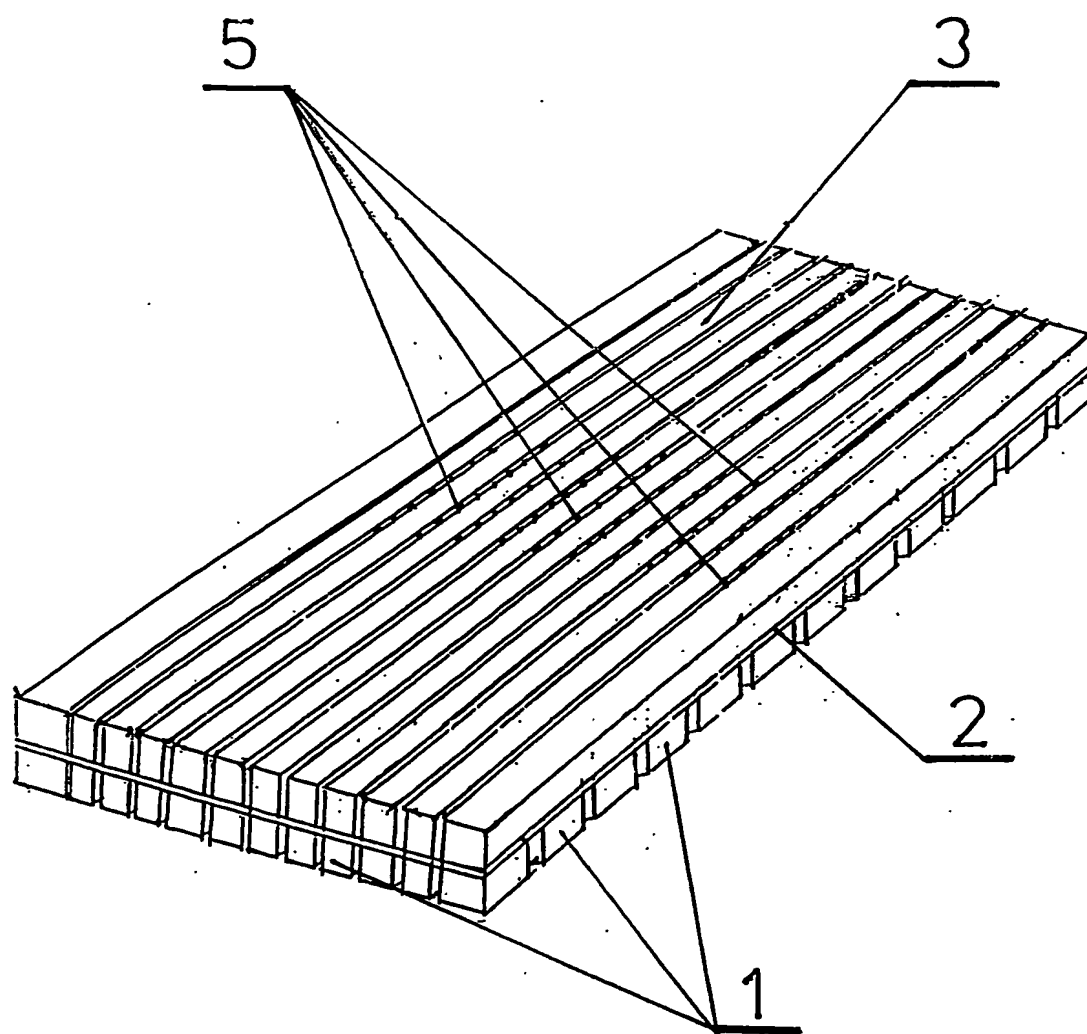


Fig.1

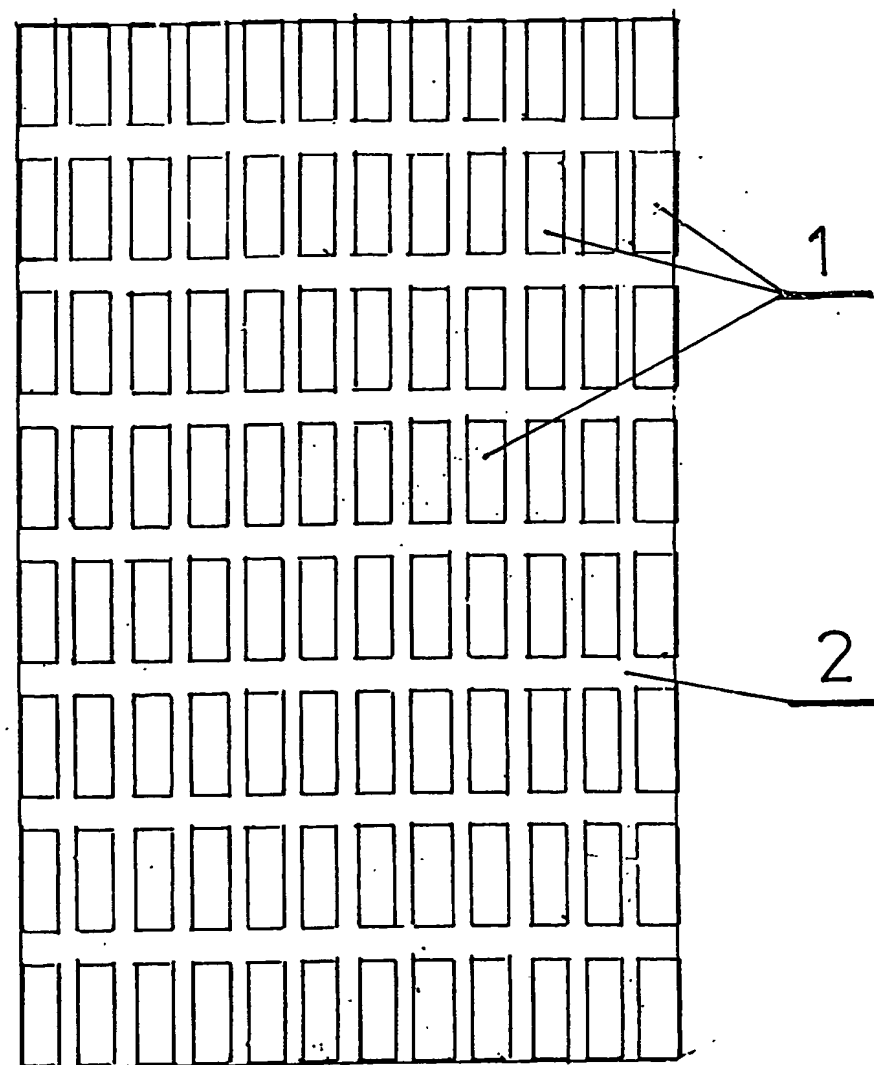


Fig.2

3/6

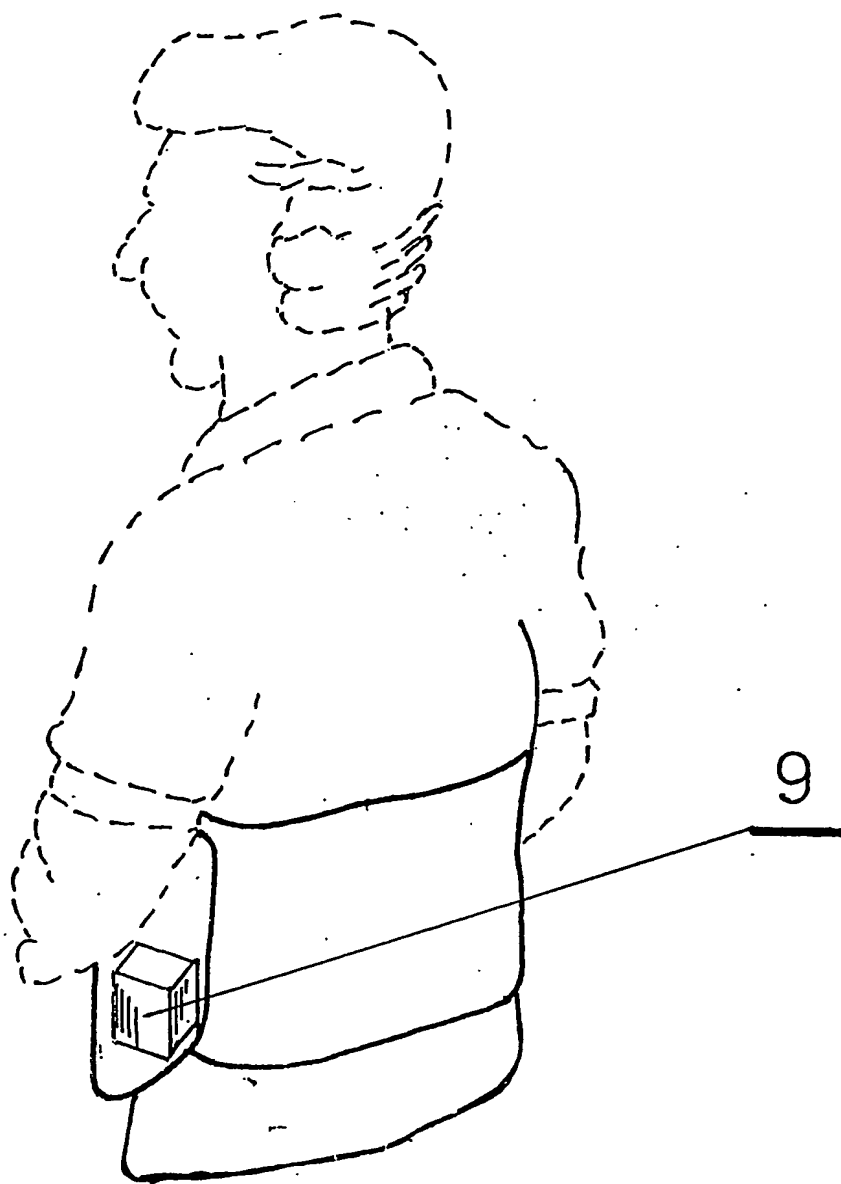


Fig.3

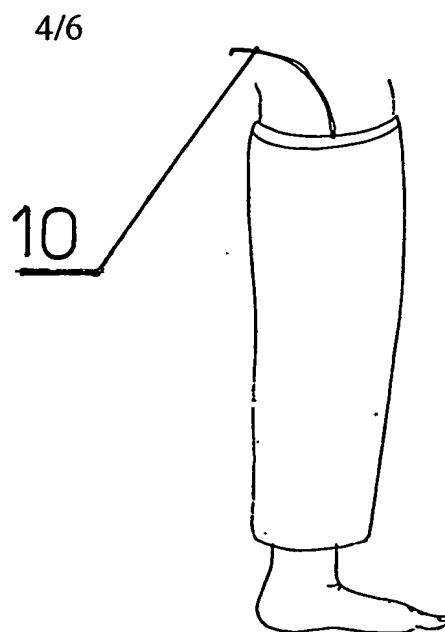


Fig.4

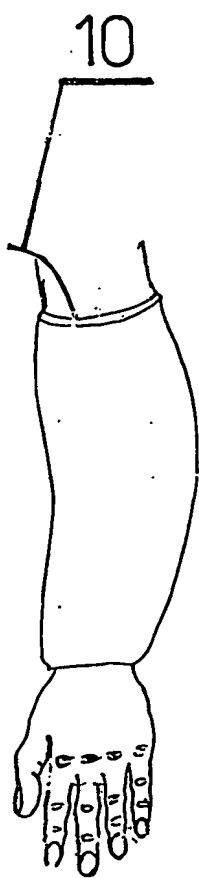


Fig.5

5/6

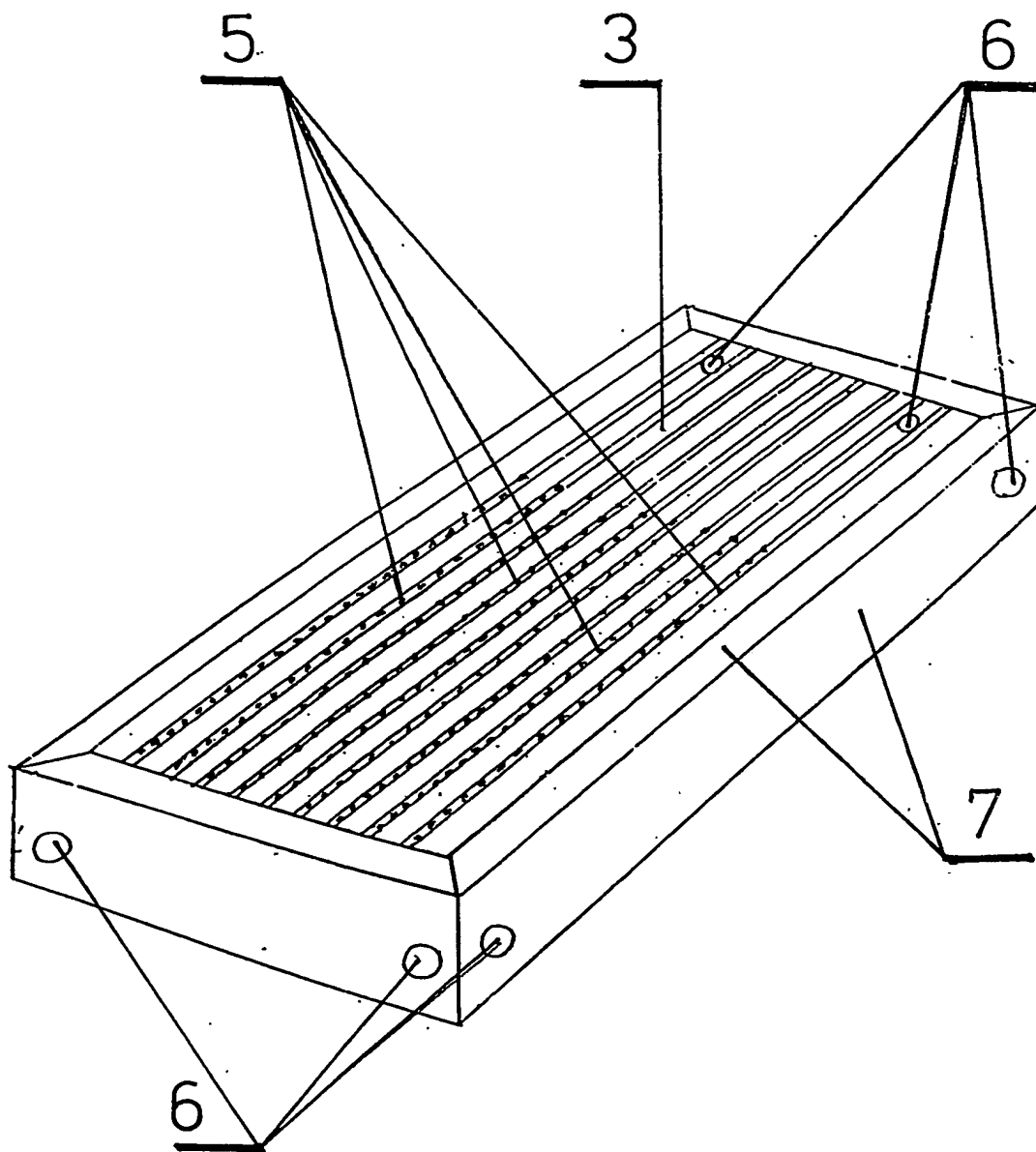


Fig.6

6/6

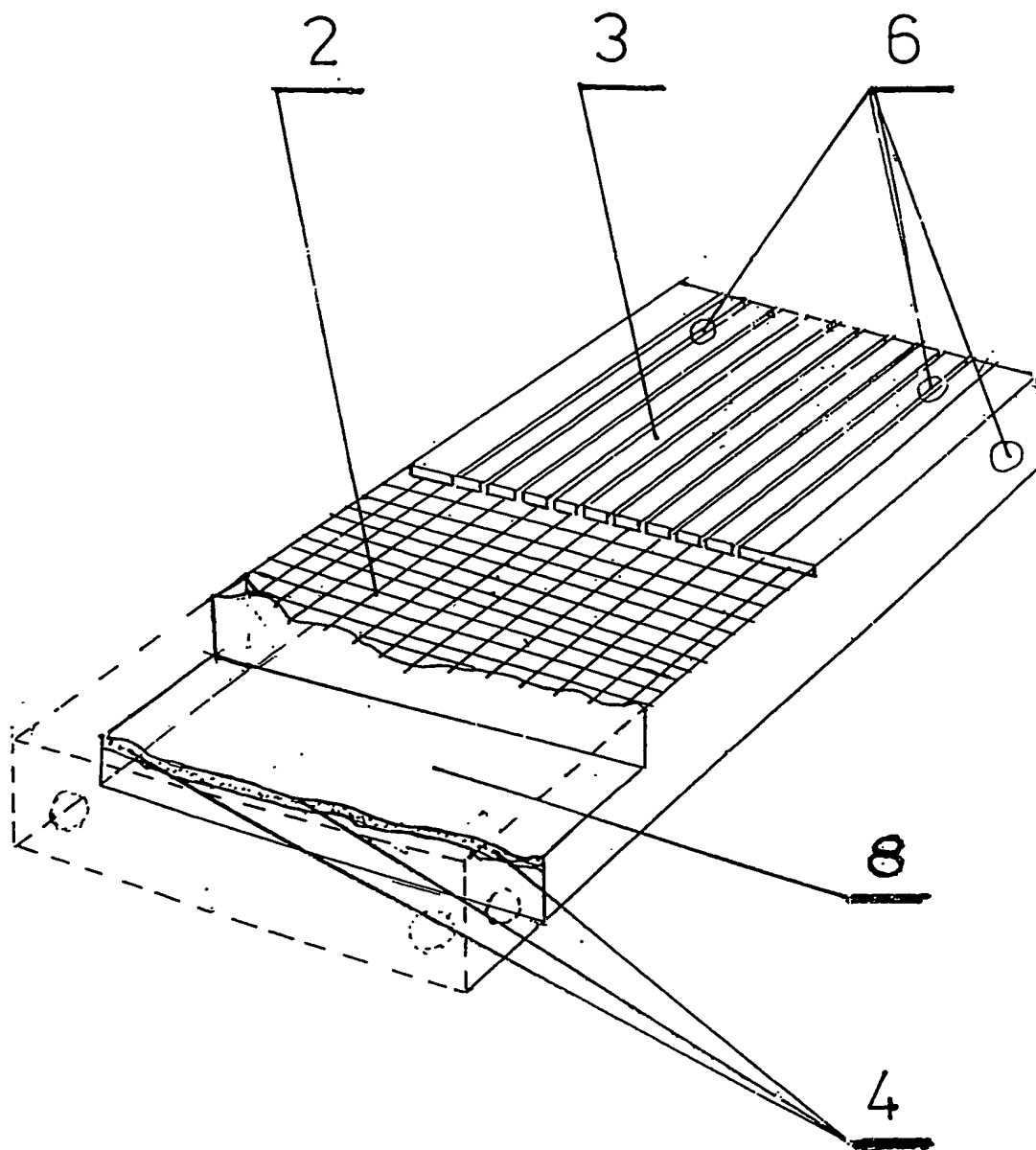


Fig.7

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/PL 00026

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61N2/00 A61N2/02 A61N1/06

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                    | Relevant to claim No. |
|------------|---|-----------------------|
| A          | US 4 471 787 A (BENTALL RICHARD H C)<br>18 September 1984 (1984-09-18)<br>abstract; claim 1; figure 1 | 1-13                  |
| A          | US 5 000 178 A (GRIFFITH NEIL J)<br>19 March 1991 (1991-03-19)<br>abstract; claim 1; figure 5         | 1-13                  |

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \* & \* document member of the same patent family

Date of the actual completion of the international search

20 June 2003

Date of mailing of the international search report

27/06/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Chopinaud, M



## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/PL 00026

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date         |
|---|---------------------|----------------------------|-----------------------------|
| US 4471787                                | A                   | 18-09-1984                 | AR 230782 A1 31-07-1984     |
|   |                     |                            | AU 568286 B2 24-12-1987     |
|   |                     |                            | AU 8862982 A 31-03-1983     |
|   |                     |                            | BE 894477 A1 17-01-1983     |
|   |                     |                            | BR 8205576 A 30-08-1983     |
|   |                     |                            | CA 1208299 A1 22-07-1986    |
|   |                     |                            | CA 1238372 A2 21-06-1988    |
|   |                     |                            | DE 8226546 U1 19-05-1983    |
|   |                     |                            | DK 423582 A 25-03-1983      |
|   |                     |                            | EP 0076074 A1 06-04-1983    |
|   |                     |                            | ES 8306442 A1 01-09-1983    |
|   |                     |                            | FR 2513130 A1 25-03-1983    |
|   |                     |                            | GB 2106394 A , B 13-04-1983 |
|   |                     |                            | GB 2151489 A , B 24-07-1985 |
|   |                     |                            | GR 76729 A1 30-08-1984      |
|   |                     |                            | IL 66841 A 31-01-1988       |
|   |                     |                            | IT 1155943 B 28-01-1987     |
|   |                     |                            | JP 58121964 A 20-07-1983    |
|   |                     |                            | MX 152360 A 02-07-1985      |
|   |                     |                            | NO 823215 A 25-03-1983      |
|   |                     |                            | DE 8226548 U1 11-05-1983    |
| US 5000178                                | A                   | 19-03-1991                 | AT 102492 T 15-03-1994      |
|   |                     |                            | AT 183400 T 15-09-1999      |
|   |                     |                            | AU 610497 B2 23-05-1991     |
|   |                     |                            | AU 7323187 A 26-11-1987     |
|   |                     |                            | BR 8702633 A 23-02-1988     |
|   |                     |                            | CA 1317639 C 11-05-1993     |
|   |                     |                            | DE 3752289 D1 23-09-1999    |
|   |                     |                            | DE 3752289 T2 20-01-2000    |
|   |                     |                            | DE 3789257 D1 14-04-1994    |
|   |                     |                            | DE 3789257 T2 23-06-1994    |
|   |                     |                            | EP 0252594 A2 13-01-1988    |
|   |                     |                            | EP 0547023 A1 16-06-1993    |
|   |                     |                            | ES 2050113 T3 16-05-1994    |
|   |                     |                            | ES 2137198 T3 16-12-1999    |
|   |                     |                            | JP 2726866 B2 11-03-1998    |
|   |                     |                            | JP 63029663 A 08-02-1988    |
|   |                     |                            | US 5014699 A 14-05-1991     |